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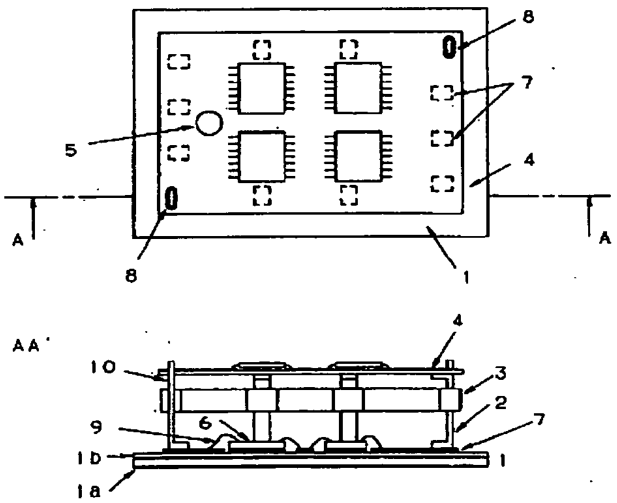
(54)【発明の名称】　電力半導体装置

(57)【要約】

【課題】　制御プリント基板と金属プリント基板で構成する電力半導体装置の構造改善

【解決手段】　片面の樹脂絶縁層１ｂで絶縁された金属ベース１ａと、前記絶縁層１ｂ上に形成される金属パターン７とで、形成する金属プリント基板１と、前記金属プリント基板１上に搭載され、アルミワイヤボンディングで配線された電力半導体チップ６と、前記電力半導体チップ６と前記金属プリント基板１で形成する電力回路を制御する制御回路を搭載した制御プリント基板４と、前記金属プリント基板１と前記制御プリント基板４を接続する、複数の中継端子２と、前記複数の中継端子同士を所定の配置に固定する樹脂タイバー３と、で構成し、前記電力半導体６を搭載した前記金属プリント基板１と前記制御プリント基板４は平行な位置関係に構成した電力半導体装置において、前記制御プリント基板４に表面実装用のランドを設け、前記制御プリント基板４側に接続する複数の中継端子２の両端部分を「コ」の字の形に曲げて表面実装技術により、前記制御プリント基板４に接続することを特徴とする電力半導体装置。



【特許請求の範囲】

【請求項１】　片面の樹脂絶縁層で絶縁された金属ベースと、前記絶縁層上に形成される金属パターンとで形成する金属プリント基板と、前記金属プリント基板上に搭載され、アルミワイヤーボンディングで配線された電力半導体チップと、前記電力半導体チップと前記金属プリント基板で形成する電力回路を制御する制御回路を搭載した制御プリント基板と、前記金属プリント基板と前記制御プリント基板を接続する、複数の中継端子と、前記複数の中継端子同士を所定の配置に固定する樹脂タイバーとで構成し、前記電力半導体チップを搭載した金属プリント基板と前記制御プリント基板は平行な位置関係にあり、前記複数の中継端子の片側は前記金属プリント基板に半田付けで接続され、反対側は前記制御プリント基板に接続された電力半導体装置において、前記複数の中継端子の両端部分は直角に曲がっており、「コ」の字の形を形成し、前記金属プリント基板及び前記制御プリント基板には表面実装で半田付けを施して接続していることを特徴とする電力半導体装置。

【請求項２】　請求項１の電力半導体装置において、前記制御プリント基板に少なくとも２個の位置決穴があり、前記複数の中継端子の少なくとも２本の中継端子は「Ｌ」の形に曲げられ、前記中継端子のまっすぐな片端が前記位置決穴を貫通することを特徴とする電力半導体装置。

【請求項３】　請求項１の電力半導体装置において、前記制御プリント基板にシリコンゲルの注入穴を設けていることを特徴とする電力半導体装置。

【請求項４】　請求項１の電力半導体装置において、前記複数の中継端子が前記制御プリント基板の周辺に配置されており、前記複数の中継端子の前記制御プリント基板側の両端部を内側に曲げ「コ」の字の形を形成し、前記中継端子が曲がった部分と前記樹脂タイバーの間に前記制御プリント基板を挟ませて、前記制御プリント基板と前記中継端子を半田付けで固定していることを特徴とする電力半導体装置。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は金属プリント基板と制御プリント基板を有し前記金属プリント基板と前記制御プリント基板を中継端子で接続する電力半導体装置に関する。

【０００２】

【従来の技術】従来の技術の一実施例を図３に示す。片面の樹脂絶縁層で絶縁された金属ベース１ａと、前記絶縁層上に形成される金属パターン７とで、形成する金属プリント基板１と、前記金属プリント基板１上に搭載され、アルミワイヤーボンディングで配線した電力半導体チップ６と、前記電力半導体チップ６と前記金属プリント基板１で形成する電力回路を制御する制御回路を搭載した制御プリント基板３４と、前記金属プリント基板１と前記制御プリント基板３４を接続する、複数の中継端子３２と、前記複数の中継端子３２同士を所定の配置に固定する樹脂タイバー３３と、で構成し、前記電力半導体チップ６を搭載した金属プリント基板１と前記制御プリント基板３４は平行な位置関係に構成した電力半導体装置である。

【０００３】前記樹脂タイバー３３で固定された前記複数の中継端子３２は前記金属ベース１上の金属パターン７に半田付けで固定される。前記制御プリント基板３４には前記複数の中継端子３２の数と同じ数のスルホール穴３５が設けられる。前記複数の中継端子３２は前記複数のスルホール穴３５を同時に貫通させて、半田付けによって前記中継端子３２と前記制御プリント基板３４は固定される。

【０００４】

【発明が解決しようとする課題】従来の技術では前記複数の中継端子を前記制御プリント基板に設けられた複数のスルホール穴に同時に貫通する必要があった。前記複数の制御端子の位置の精度、前記制御プリント基板の複数のスルホール穴の精度の問題によって前記複数の中継端子を前記複数のスルホール穴に同時に通すことは困難であり組立に時間がかかる。

【０００５】前記電力半導体チップ及び前記アルミワイヤーボンディングを保護するシリコンゲルを注入するために、前記中継端子と前記金属プリント基板をリフロー炉のような流れライン上で半田付けした後、前記シリコンゲルを注入し、前記制御プリント基板を前記制御端子に半田付けをする必要がある。すなわち、前記シリコンゲルを注入した後前記制御プリント基板の半田付けを行うので、前記シリコンゲルが高温にさらされるリフロー炉の半田付け工程は使用できず、手作業の半田付けが必要になる。

【０００６】

【課題を解決するための手段】第一の発明は、片面の樹脂絶縁層で絶縁された金属ベースと、前記絶縁層上に形成される金属パターンとで、形成する金属プリント基板と、前記金属プリント基板上に搭載され、アルミワイヤーボンディングで配線された電力半導体チップと、前記電力半導体チップと前記金属プリント基板で形成する電力回路を制御する制御回路を搭載した制御プリント基板と、前記金属プリント基板と前記制御プリント基板を接続する、複数の中継端子と、前記複数の中継端子同士を所定の配置に固定する樹脂タイバーと、で構成し、前記電力半導体を搭載した金属プリント基板と前記制御プリント基板は平行な位置関係に構成した電力半導体装置において、前記制御プリント基板に表面実装用のランドをもうけ、前記制御プリント基板側に接続する複数の中継端子の両端部分を曲げ、「コ」の字の形を形成し、表面実装技術により、前記制御プリント基板に接続すること

を特徴とする電力半導体装置である。すなわち、前記制御プリント基板を前記中継端子に載せ、前記制御プリント基板に設けられた表面実装用ランドに前記中継端子の両端が「コ」の字の形に曲げた部分の片端を合わせて、表面実装技術により半田付け及び固定を行う。

【０００７】第二の発明は第一の発明の電力半導体装置において、前記制御プリント基板に少なくとも２個の位置決穴を設けて、前記複数の中継端子の少なくとも２本の中継端子を前記の「コ」の字の形に曲げず、前記制御プリント側の端まっすぐな形状で前記位置決穴に貫通し、前記少なくとも２本の中継端子を固定した後、前記複数の中継端子の表面実装の半田づけを施すことを特徴とする電力半導体装置である。すなわち、前記複数の中継端子の少なくとも２本の中継端子を前記制御プリント基板を貫通し、前記制御プリント基板と前記金属プリント基板の位置関係を固定することでその他の制御端子の位置がそれぞれの表面実装用ランドに合うようになる。各中継端子がそれぞれのランドに合った状態で前記各中継端子の半田付けを施す。

【０００８】第三の発明は第一の発明の電力半導体装置において、前記制御プリント基板にシリコンゲル注入穴を設けることを特徴とする電力半導体装置である。すなわち、シリコンゲル注入用のシリコンゲル注入口を設けて、前記制御プリント基板の半田付けを施した後にシリコンゲルを注入する。

【０００９】第四の発明は第一の発明の電力半導体装置において、前記複数の中継端子を前記制御プリント基板の周辺に配置し、前記複数の中継端子の両端部を内側に「コ」の字の形に曲げて、前記中継端子が曲がった部分と前記樹脂タイバーの間に前記制御プリント基板を挟む様に固定して、前記制御プリント基板と前記中継端子を半田付けで固定することを特徴とする電力半導体装置である。すなわち、前記制御プリント基板を前記中継端子の「コ」の字に曲がった部分と樹脂タイバーの間に挟み込むことで前記表面実装用のランドと前記中継端子との位置関係が固定できる。前記中継端子と前記制御プリント基板の表面実装のランドの位置関係が固定された後にこのランドと前記中継端子との半田付けが施される。

【００１０】

【発明の実施の形態】第一の発明の実施の形態を図１を参照して説明する。片面の樹脂絶縁層１ｂで絶縁された金属ベース１ａと、前記絶縁層１ｂ上に形成される金属パターン７とで、形成する金属プリント基板１と、前記金属プリント基板１上に搭載され、アルミワイヤーボンディングで配線された電力半導体チップ６と、前記電力半導体チップ６と前記金属プリント基板１で形成する電力回路を制御する制御回路を搭載した制御プリント基板４と、前記金属プリント基板１と前記制御プリント基板４を接続する、複数の中継端子２と、前記複数の中継端子同士を所定の配置に固定する樹脂タイバー３と、で構成し、前記電力半導体６を搭載した前記金属プリント基板１と前記制御プリント基板４を平行な位置関係に構成した電力半導体装置において、前記制御プリント基板４に表面実装用のランドを設け、前記制御プリント基板４側に接続する複数の中継端子２の両端部分を曲げて「コ」の字の形にして表面実装技術により、前記制御プリント基板４及び前記金属プリント基板１に接続することを特徴とする電力半導体装置である。

【００１１】この電力半導体装置の組立プロセスでは前記金属プリント基板１にエッチングで電力回路用の金属パターン７を施した後、前記金属パターン７上に前記電力半導体チップ６を半田付けによって搭載し、アルミワイヤーボンディング９により前記金属パターン７と前記電力半導体チップ６の間の回路を形成する。さらに、前記金属パターン７を形成するプロセスで前記複数の中継端子２を半田付けするためのランドを設ける。

【００１２】前記金属パターン７上のランドには前記樹脂タイバー３で固定した前記複数の中継端子２を載せ、前記制御プリント基板４を前記複数の中継端子２の上に載せ、同時にリフロー炉などの連続半田付け炉で半田付けを施して前記金属プリント基板１と前記中継端子２と前記制御プリント基板４を接続して固定する。

【００１３】第二の発明の実施の形態を図１参照しながら説明する。第一の発明の電力半導体装置において、前記制御プリント基板４に少なくとも２個の位置決穴８を設けて、前記複数の中継端子２の少なくとも２本の中継端子を「Ｌ」の字の形に曲げ、前記２本の中継端子のまっすぐな片端が前記位置決穴を貫通し、位置決穴がスルホールである場合には、半田付けによって前記少なくとも２本の中継端子が前記制御プリント基板４と前記中継端子２を固定すると同時に前記金属プリント基板１に接続し固定することを特徴とする電力半導体装置である。

【００１４】第三の発明の実施の形態を図１に示す。第一の発明の電力半導体装置において、前記制御プリント基板４に直径５ｍｍ程度のシリコンゲルの注入穴５を設けることを特徴とする電力半導体装置である。前記金属プリント基板１と中継端子２と前記制御プリント基板４をリフロー炉等の連続半田付け炉で同時に半田付けを施す。そこでアルミワイヤーボンデイング９及び電力半導体チップ６を保護するためのシリコンゲルを前記シリコンゲル注入穴５によって、半田付け工程の後にシリコンゲルを注入する。

【００１５】第四の発明の実施の形態を図２を参照しながら説明する。第一の発明の電力半導体装置において、前記複数の中継端子２２を前記制御プリント基板２４の周辺に配置し、前記複数の中継端子２２の前記制御プリント基板２４側の両端部を内側に「コ」の字の形に曲げて、前記中継端子が曲がった部分と前記樹脂タイバー２３の間に前記制御プリント基板２４を挟む様に固定して、前記制御プリント基板２４と前記複数の中継端子を

半田付けで接続し、固定することを特徴とする電力半導体装置である。

【００１６】

【発明の効果】前記複数の中継端子２の両端部分を「コ」の字の形に曲げて前記制御プリント基板４に表面実装技術により半田付けを施す事によって前記制御プリント基板４と前記金属プリント基板１を接続する中継端子２の前記制御プリント基板４のスルホールへの差し込む必要が無くなるので作業時間の短縮が図れる。

【００１７】なお、シリコンゲルの注入穴５を設けたことで前記複数の中継端子２を前記金属ベース１ａと前記制御プリント基板４にリフロー炉によって同時に半田付けをすることができ、前記電力半導体チップ６とアルミワイヤーボンディングの保護用のシリコンゲルの注入はすべての半田付けが終わった後に前記シリコンゲルの注入穴５から前記シリコンゲルを注入することができ、手作業の半田付けが無くなり、製造工数が減る。

【図面の簡単な説明】

【図１】本発明の実施の形態の図面である。

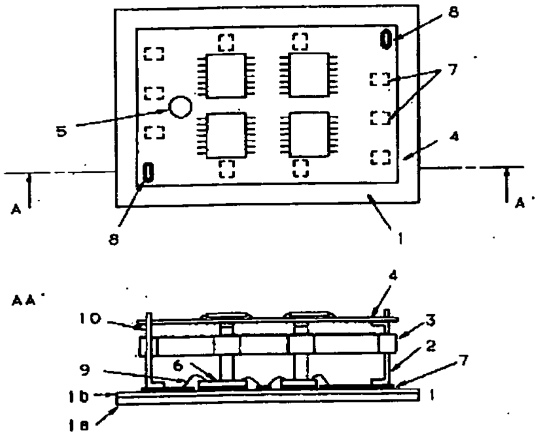
【図２】本発明の実施の形態の図面である。

【図３】従来技術の一実施例の図面である。

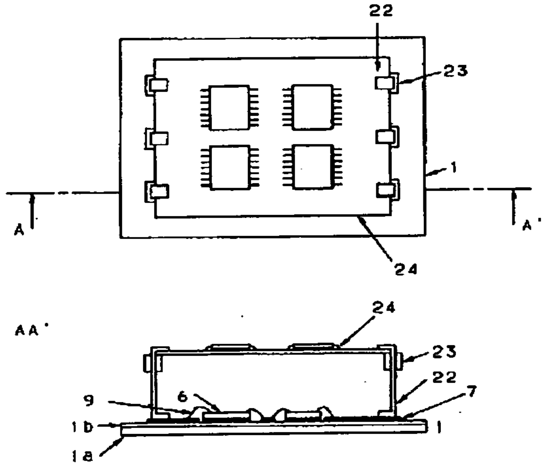
【符号の説明】

１	金属ベース
１ａ	樹脂絶縁層
１ｂ	金属ベース
２、２２、３２	複数の中継端子
３、２３、３３	樹脂タイバー
４、２４、３４	制御プリント基板
５	シリコンゲル注入穴
６	電力半導体チップ
７	金属パターン
８	２個の位置決穴
９	アルミワイヤーボンディング
１０	２本の中継端子
３５	複数のスルホール穴

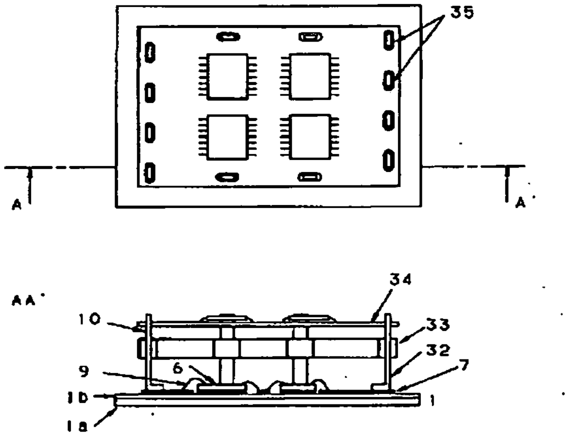
【図１】



【図２】



【図３】



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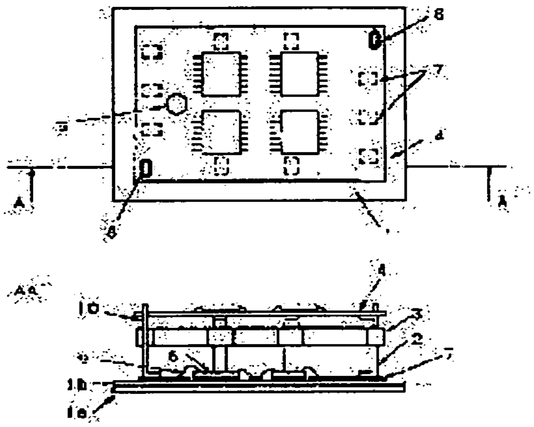
4) POWER SEMICONDUCTOR DEVICE

7)Abstract:

ROBLEM TO BE SOLVED: To reduce work time by eliminating work for serting relay terminals for connecting a control printed board to a metal inted board into through- holes of the control printed board.
OLUTION: This device comprises a metal printed board 1, having a metal ise insulated by a resin insulation layer 1b at one side and metal pattern formed in a board 1b, a power semiconductor chip 6 which is mounted 1 the board 1 and wired by Al wire bonding, a control printed board 4 wing a control circuit for controlling a power circuit formed with the ard 1, relay terminals 2 for connecting the board 1 to the board 4, and sin tie bars 3 for fixing the relay terminals in a specified layout. Surface ount lands are provided on the board 4 parallel to the board 4. Both ids of the relay terminal 2 connected to the board 4 are bent into a U- tter shape and connected to the board 4 by a surface mount technique.



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LAIMS

:laim(s)]

:laim 1] The metal printed circuit board formed by the metal base insulated by the resin insulating layer of one side, ıd the metal pattern formed on the aforementioned insulating layer, The power-semiconductor chip which it was ırried on the aforementioned metal printed circuit board, and was wired by aluminum wire bonding, The orementioned power-semiconductor chip and the control printed circuit board in which the control circuit which ıntrols the power circuit formed by the aforementioned metal printed circuit board was carried, Two or more relay rminals which connect the aforementioned metal printed circuit board and the aforementioned control printed circuit ›ard, Two or more aforementioned relay terminals are constituted from a resin tie rod fixed to predetermined rangement. The metal printed circuit board and the aforementioned control printed circuit board in which the orementioned power-semiconductor chip was carried are in parallel physical relationship. In the power-miconductor equipment by which one side of two or more aforementioned relay terminals was connected to the orementioned metal printed circuit board with soldering, and the opposite side was connected to the aforementioned ıntrol printed circuit board A part for the both ends of two or more aforementioned relay terminals is power-miconductor equipment characterized by having bent right-angled, having formed the form of the character of "KO", ıving soldered to the aforementioned metal printed circuit board and the aforementioned control printed circuit board, ıd having connected with them by the surface mount.

:laim 2] It is power-semiconductor equipment characterized by for there being at least two locating holes in the orementioned control printed circuit board, for at least two relay terminals of two or more aforementioned relay rminals being bent by the form of "L" in the power-semiconductor equipment of a claim 1, and straight one end of e aforementioned relay terminal penetrating the aforementioned locating hole.

:laim 3] Power-semiconductor equipment characterized by having established the pouring hole of silicon gel in the orementioned control printed circuit board in the power-semiconductor equipment of a claim 1.

:laim 4] The power-semiconductor equipment carry out two or more aforementioned relay terminals being arranged ound the aforementioned control printed circuit board, bending the both ends by the side of the aforementioned ıntrol printed circuit board of two or more aforementioned relay terminals inside in the power-semiconductor ļuipment of a claim 1, forming the form of the character of "KO", and the aforementioned relay terminal making the orementioned control printed circuit board pinch between the portion bent, and the aforementioned resin tie rod, and ‹ing the aforementioned control printed circuit board and the aforementioned relay terminal by soldering as the ature.

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ETAILED DESCRIPTION

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etailed Description of the Invention]

001]

he technical field to which invention belongs] this invention relates to the power-semiconductor equipment which s a metal printed circuit board and a control printed circuit board, and connects the aforementioned metal printed rcuit board and the aforementioned control printed circuit board with a relay terminal.

002]

escription of the Prior Art] One example of a Prior art is shown in drawing 3 . By metal base 1a insulated by the sin insulating layer of one side, and the metal pattern 7 formed on the aforementioned insulating layer The metal inted circuit board 1 to form and the power-semiconductor chip 6 which was carried on the aforementioned metal inted circuit board 1, and wired by aluminum wire bonding, The aforementioned power-semiconductor chip 6 and e control printed circuit board 34 in which the control circuit which controls the power circuit formed by the orementioned metal printed circuit board 1 was carried, Two or more relay terminals 32 which connect the orementioned metal printed circuit board 1 and the aforementioned control printed circuit board 34, the metal printed rcuit board 1 and the aforementioned control printed circuit board 34 in which it came out with the resin tie rod 33 xed to predetermined arrangement, two or more relay terminal 32 above was constituted, and the aforementioned wer-semiconductor chip 6 was carried are power-semiconductor equipment constituted in parallel physical lationship

003] Two or more aforementioned relay terminals 32 fixed by the aforementioned resin tie rod 33 are fixed to the etal pattern 7 on the aforementioned metal base 1 with soldering. The through hole hole 35 of the same number as the mber of two or more aforementioned relay terminals 32 is established in the aforementioned control printed circuit ard 34. Two or more aforementioned relay terminals 32 make two or more aforementioned through hole holes 35 netrate simultaneously, and the aforementioned relay terminal 32 and the aforementioned control printed circuit ard 34 are fixed by soldering.

004]

roblem(s) to be Solved by the Invention] in the Prior art, it needed to penetrate simultaneously in two or more rough hole holes in which two or more aforementioned relay terminals were prepared by the aforementioned control inted circuit board By the problem of the precision of the position of two or more aforementioned control terminals, d the precision of two or more through hole holes of the aforementioned control printed circuit board, it is difficult to t two or more aforementioned relay terminals pass simultaneously in two or more aforementioned through hole holes, d it requires time for assembly.

005] In order to pour in the silicon gel which protects the aforementioned power-semiconductor chip and the orementioned aluminum wire bonding, after soldering the aforementioned relay terminal and the aforementioned etal printed circuit board on a flow line like a reflow furnace, the aforementioned silicon gel is poured in and it is cessary to solder the aforementioned control printed circuit board to the aforementioned control terminal. That is, nce the account control printed circuit board of back to front which poured in the aforementioned silicon gel is ldered, the soldering process of a reflow furnace that the aforementioned silicon gel is exposed to an elevated mperature cannot be used, but soldering of a handicraft is needed.

006]

eans for Solving the Problem] The first invention is with the metal base insulated by the resin insulating layer of one de, and the metal pattern formed on the aforementioned insulating layer. The metal printed circuit board to form and e power-semiconductor chip which it was carried on the aforementioned metal printed circuit board, and was wired y aluminum wire bonding, The aforementioned power-semiconductor chip and the control printed circuit board in hich the control circuit which controls the power circuit formed by the aforementioned metal printed circuit board as carried, Two or more relay terminals which connect the aforementioned metal printed circuit board and the oremented control printed circuit board, In the power-semiconductor equipment which came out with the resin tie d fixed to predetermined arrangement, constituted two or more aforementioned relay terminals, and was constituted physical relationship with parallel metal printed circuit board and aforementioned control printed circuit board in hich the aforementioned power semiconductor was carried It is power-semiconductor equipment which prepares the nd for surface mounts in the aforementioned control printed circuit board, bends a part for the both ends of two or ore relay terminals linked to the aforementioned control printed circuit board side, forms the form of the character of O", and is characterized by connecting with the aforementioned control printed circuit board by the surface mount chnology. That is, the aforementioned control printed circuit board is put on the aforementioned relay terminal, and e ends of the aforementioned relay terminal double one end of the portion bent in the form of the character of "KO", d perform soldering and fixation to the land for surface mounts prepared in the aforementioned control printed rcuit board by the surface mount technology.

007] The second invention prepares at least two locating holes in the aforementioned control printed circuit board in e power-semiconductor equipment of the first invention. At least two relay terminals of two or more aforementioned lay terminals are not bent in the form of the character of the aforementioned "KO." the edge straight configuration by e side of the aforementioned control print -- the aforementioned locating hole -- penetrating -- the above -- even if w, after fixing two relay terminals, it is power-semiconductor equipment characterized by soldering the surface ount of two or more aforementioned relay terminals That is, the aforementioned control printed circuit board is netrated for at least two relay terminals of two or more aforementioned relay terminals, and the position of other ntrol terminals comes to suit each land for surface mounts by fixing the physical relationship of the aforementioned ntrol printed circuit board and the aforementioned metal printed circuit board. After each relay terminal has suited ch land, each aforementioned relay terminal is soldered.

008] The third invention is power-semiconductor equipment characterized by establishing a silicon gel pouring hole the aforementioned control printed circuit board in the power-semiconductor equipment of the first invention. That , the silicon gel inlet for silicon gel pouring is prepared, and silicon gel is poured in after soldering the orementioned control printed circuit board.

009] The fourth invention arranges two or more aforementioned relay terminals in the power-semiconductor uipment of the first invention around the aforementioned control printed circuit board. It is power-semiconductor uipment characterized by bending the both ends of two or more aforementioned relay terminals in the form of the aracter of "KO" inside, fixing so that the aforementioned control printed circuit board may be pinched between the rtion at which the aforementioned relay terminal turned, and the aforementioned resin tie rod, and fixing the orementioned control printed circuit board and the aforementioned relay terminal with soldering. That is, the physical lationship of the land for the aforementioned surface mounts and the aforementioned relay terminal is fixable by tting the aforementioned control printed circuit board between the portion at which it turned into the character of O" of the aforementioned relay terminal, and a resin tie rod. After the physical relationship of the land of the surface ount of the aforementioned relay terminal and the aforementioned control printed circuit board is fixed, soldering of is land and the aforementioned relay terminal is given.

010]

mbodiments of the Invention] The form of implementation of the first invention is explained with reference to awing 1 . By metal base 1a insulated by resin insulating-layer 1b of one side, and the metal pattern 7 formed on the orementioned insulating-layer 1b The metal printed circuit board 1 to form and the power-semiconductor chip 6 hich it was carried on the aforementioned metal printed circuit board 1, and was wired by aluminum wire bonding, e aforementioned power-semiconductor chip 6 and the control printed circuit board 4 in which the control circuit hich controls the power circuit formed by the aforementioned metal printed circuit board 1 was carried, Two or more lay terminals 2 which connect the aforementioned metal printed circuit board 1 and the aforementioned control inted circuit board 4, In the power-semiconductor equipment which came out with the resin tie rod 3 fixed to edetermined arrangement, constituted two or more aforementioned relay terminals, and constituted the orementioned metal printed circuit board 1 in which the aforementioned power semiconductor 6 was carried, and the orementioned control printed circuit board 4 in parallel physical relationship The land for surface mounts is prepared the aforementioned control printed circuit board 4, a part for the both ends of two or more relay terminals 2 linked to e aforementioned control printed circuit board 4 side is bent, and it is made the form of the character of "KO". by the rface mount technology It is power-semiconductor equipment characterized by connecting with the aforementioned ntrol printed circuit board 4 and the aforementioned metal printed circuit board 1.

011] In the assembly process of this power-semiconductor equipment, after giving the metal pattern 7 for power rcuits to the aforementioned metal printed circuit board 1 by etching, the aforementioned power-semiconductor chip is carried by soldering on the aforementioned metal pattern 7, and the circuit between the aforementioned metal ttern 7 and the aforementioned power-semiconductor chip 6 is formed by the aluminum wire bonding 9. rthermore, the land for soldering the relay terminal 2 of the aforementioned plurality in the process which forms the orementioned metal pattern 7 is prepared.

012] Two or more aforementioned relay terminals 2 fixed to the land on the aforementioned metal pattern 7 by the orementioned resin tie rod 3 are carried, and the aforementioned control printed circuit board 4 is carried on two or ore aforementioned relay terminals 2, and it solders at continuation soldering furnaces, such as a reflow furnace, multaneously, and the aforementioned metal printed circuit board 1, the aforementioned relay terminal 2, and the orementioned control printed circuit board 4 are connected, and it fixes.

013] It explains carrying out the drawing 1 reference of the form of implementation of the second invention. In the wer-semiconductor equipment of the first invention, at least two locating holes 8 are formed in the aforementioned ntrol printed circuit board 4. At least two relay terminals of two or more aforementioned relay terminals 2 are bent in e form of the character of "L." Straight one end of two aforementioned relay terminals penetrates the aforementioned cating hole, and when a locating hole is a through hole soldering -- the above -- even if few, while two relay rminals fix the aforementioned control printed circuit board 4 and the aforementioned relay terminal 2, it is power-miconductor equipment characterized by connecting and fixing to the aforementioned metal printed circuit board 1

014] The form of implementation of the third invention is shown in drawing 1 . In the power-semiconductor uipment of the first invention, it is power-semiconductor equipment characterized by establishing the pouring hole 5 silicon gel with a diameter of about 5mm in the aforementioned control printed circuit board 4. The aforementioned etal printed circuit board 1, the relay terminal 2, and the aforementioned control printed circuit board 4 are multaneously soldered at continuation soldering furnaces, such as a reflow furnace. Then, by the aforementioned licon gel pouring hole 5, silicon gel is poured in for the silicon gel for protecting the aluminum wirebonding 9 and the wer-semiconductor chip 6 after a soldering process.

015] The form of implementation of the fourth invention is explained referring to drawing 2 . In the power-miconductor equipment of the first invention, two or more aforementioned relay terminals 22 are arranged around e aforementioned control printed circuit board 24. Bend the both ends by the side of the aforementioned control inted circuit board 24 of two or more aforementioned relay terminals 22 in the form of the character of "KO" inside, d it fixes so that the aforementioned control printed circuit board 24 may be pinched between the portion at which e aforementioned relay terminal turned, and the aforementioned resin tie rod 23. It is power-semiconductor uipment which connects two or more aforementioned relay terminals with the aforementioned control printed circuit ard 24 with soldering, and is characterized by fixing.

016]

ffect of the Invention] Since the need for the through hole of the aforementioned control printed circuit board 4 of e relay terminal 2 which connects the aforementioned control printed circuit board 4 and the aforementioned metal inted circuit board 1 by bending a part for the both ends of two or more aforementioned relay terminals 2 in the form the character of "KO", and soldering to the aforementioned control printed circuit board 4 by the surface mount chnology of inserting is lost, shortening of working hours can be aimed at.

017] In addition, the relay terminal 2 of the aforementioned plurality in having formed the pouring hole 5 of silicon l can be simultaneously soldered to the aforementioned metal base 1a and the aforementioned control printed circuit ard 4 at a reflow furnace, in pouring of the silicon gel for protection of the aforementioned power-semiconductor ip 6 and aluminum wire bonding, after all soldering finishes, the aforementioned silicon gel can be poured in from e pouring hole 5 of the aforementioned silicon gel, and it is lost in soldering of a handicraft, and a manufacture man y decreases.

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RAWINGS

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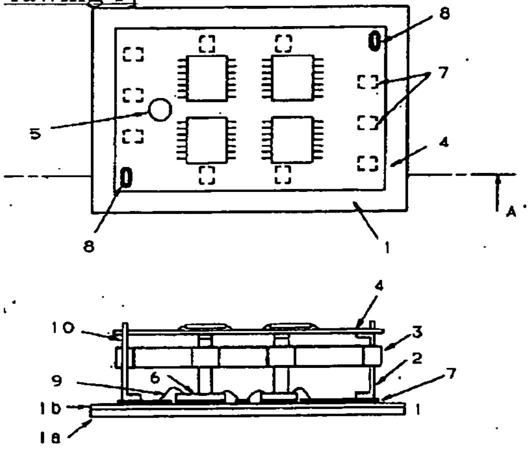
rawing 1]



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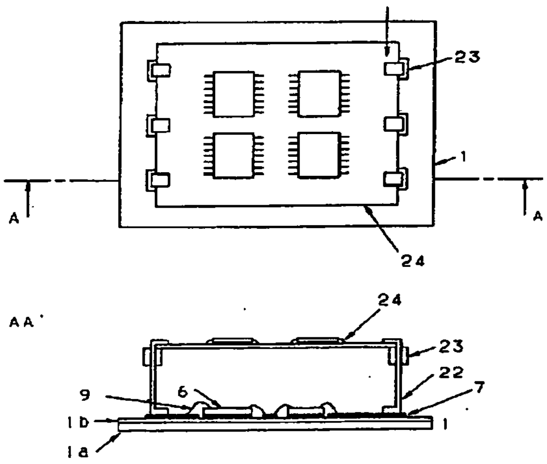

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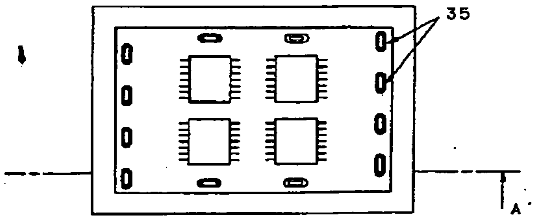

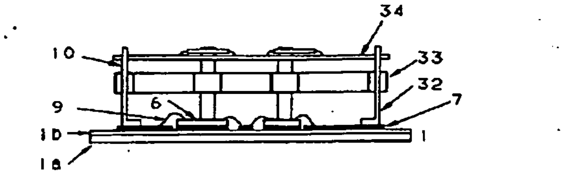

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